DESCRIPTIVE PAMPHLET, 1952

The Rockefeller University
# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporation</td>
<td>5</td>
</tr>
<tr>
<td>Board of Trustees</td>
<td>5</td>
</tr>
<tr>
<td>Board of Scientific Directors</td>
<td>5</td>
</tr>
<tr>
<td>Executive Officers</td>
<td>5</td>
</tr>
<tr>
<td><strong>SCIENTIFIC STAFF</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>ADMINISTRATIVE AND OTHER APPOINTMENTS</strong></td>
<td>9</td>
</tr>
<tr>
<td><strong>HISTORY</strong></td>
<td>10</td>
</tr>
<tr>
<td>Endowment</td>
<td>10</td>
</tr>
<tr>
<td>Bequests and Gifts</td>
<td>10</td>
</tr>
<tr>
<td>Purposes</td>
<td>10</td>
</tr>
<tr>
<td>Development</td>
<td>11</td>
</tr>
<tr>
<td><strong>ORGANIZATION</strong></td>
<td>14</td>
</tr>
<tr>
<td>Administration</td>
<td>14</td>
</tr>
<tr>
<td>Departments of the Institute</td>
<td>15</td>
</tr>
<tr>
<td>The Department of the Laboratories</td>
<td>15</td>
</tr>
<tr>
<td>The Department of the Hospital</td>
<td>17</td>
</tr>
<tr>
<td>Admission of Patients</td>
<td>18</td>
</tr>
<tr>
<td>General Statement</td>
<td>18</td>
</tr>
<tr>
<td>Appointments to the Scientific Staff</td>
<td>19</td>
</tr>
<tr>
<td>Technical Employees</td>
<td>20</td>
</tr>
<tr>
<td>Services Auxiliary to Research</td>
<td>21</td>
</tr>
<tr>
<td>Discoveries and Inventions</td>
<td>21</td>
</tr>
<tr>
<td><strong>PRESENT SCOPE OF THE SCIENTIFIC WORK</strong></td>
<td>21</td>
</tr>
<tr>
<td>The Department of the Laboratories</td>
<td>21</td>
</tr>
<tr>
<td>The Department of the Hospital</td>
<td>38</td>
</tr>
<tr>
<td><strong>BUILDINGS AND EQUIPMENT</strong></td>
<td>42</td>
</tr>
<tr>
<td><strong>PUBLICATIONS</strong></td>
<td>45</td>
</tr>
<tr>
<td>The Journal of Experimental Medicine</td>
<td>45</td>
</tr>
<tr>
<td>The Journal of General Physiology</td>
<td>46</td>
</tr>
<tr>
<td>Studies from The Rockefeller Institute for Medical Research</td>
<td>46</td>
</tr>
<tr>
<td>Monographs</td>
<td>46</td>
</tr>
<tr>
<td>Semiannual List</td>
<td>47</td>
</tr>
<tr>
<td><strong>ACKNOWLEDGMENTS</strong></td>
<td>49</td>
</tr>
</tbody>
</table>
CORPORATION

Board of Trustees

BARKLIE HENRY, A.B.
GEORGE MURNANE, C.E.
JOHN DAVISON ROCKEFELLER, Jr., A.B., A.M., LL.D.
TERM EXPIRES IN OCTOBER, 1952

LINDSLEY FISKE KIMBALL, A.B., Ph.D.
DAVID ROCKEFELLER, B.S., Ph.D.; President of the Corporation and of the Board
GEORGE HOYT WHIPPLE, A.B., M.D., A.M.(Hon.), Sc.D., LL.D.; Vice-President of the Corporation and of the Board
TERM EXPIRES IN OCTOBER, 1953

DONALD KIRK DAVID, A.B., M.B.A., LL.D.
HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.
JOHN C. TRAPHAGEN, LL.D.
TERM EXPIRES IN OCTOBER, 1954

Board of Scientific Directors

ALPHONSE RAYMOND DOCHEZ, A.B., M.D., Sc.D.; Secretary of the Board
VINCENT DU VIGNEAUD, B.S., M.S., Ph.D.
WARFIELD THEOBALD LONGCOPE, A.B., M.D., Sc.D., LL.D., Dr., hon. causa; President of the Board
TERM EXPIRES IN OCTOBER, 1952

DETLEV WULF BRONK, A.B., M.S., Ph.D., Sc.D., LL.D.
TERM EXPIRES IN OCTOBER, 1953

ROSS GRANVILLE HARRISON, A.B., Ph.D., M.D., A.M.(Hon.), Sc.D., Ph.D. (Hon.), M.D.(Hon.), LL.D.; Vice-President of the Board
GEORGE HOYT WHIPPLE, A.B., M.D., A.M.(Hon.), Sc.D., LL.D.
TERM EXPIRES IN OCTOBER, 1954

HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.

Executive Officers

EDWARD ROBINSON, A.B.; Treasurer of the Corporation
EDWARD EMERSON, A.B.; Assistant Treasurer of the Corporation
EDRIC BROOKS SMITH, B.S.; Secretary of the Corporation and of the Board of Trustees; Business Manager

Counsel

THOMAS McELRATH DEBEVOISE, A.B., LL.B.; Counsel
JOHN EDWARDS LOCKWOOD, A.B., LL.B.; Associate Counsel
SCIENTIFIC STAFF

Members of the Institute

HERBERT SPENCER GASSER, A.B., A.M., M.D., Sc.D., LL.D.; Physiology; Director of the Institute; Director of the Department of the Laboratories
THOMAS MILTON RIVERS, A.B., M.D., Sc.D.; Medicine; Director of the Department of the Hospital; Physician-in-Chief to the Hospital
REGINALD MacGREGOR ARCHIBALD, A.B., A.M., Ph.D., M.D.; Medicine; Physician to the Hospital
LYMAN CREIGHTON CRAIG, B.S., Ph.D.; Biochemistry
VINCENT PAUL DOLE, Jr., A.B., M.D.; Medicine; Physician to the Hospital
RENÉ JULES DUBOS, B.S., M.S., Ph.D., Sc.D., M.D.(Hon.); Pathology and Microbiology
WALTER FREDERICK GOEBEL, A.B., A.M., Ph.D.; Biochemistry
FRANK LAPPIN HORSFALL, JR., A.B., M.D., C.M.; Medicine; Physician to the Hospital
MOSES KUNITZ, B.S., Ph.D.; General Physiology
HENRY GEORGE KUNKEL, A.B., M.D.; Medicine; Physician to the Hospital
DAVID PIERCE CARADOC LLOYD, A.B., B.S., D.PHL.; Physiology
LEWIS GIBSON LONGSWORTH, A.B., A.M., Ph.D.; Physical Chemistry
RAFAEL LORENTE DE NÓ, M.D.; Physiology
MACLYN McCARTY, A.B., M.D.; Medicine; Physician to the Hospital
PHILIP DURYÉE McMASTER, B.S., M.D.; Pathology and Microbiology
ALFRED EZRA MIRSKY, A.B., Ph.D.; General Physiology
STANFORD MOORE, A.B., Ph.D.; Biochemistry
JOHN HOWARD NORTHRUP, B.S., A.M., Ph.D., Sc.D., LL.D.; General Physiology
RICHARD EDWIN SHOPE, M.D., M.S.(Hon.), V.M.D.(Hon.); Animal Pathology
WILLIAM HOWARD STEIN, B.S., Ph.D.; Biochemistry
DILWORTH WAYNE WOOLLEY, B.S., M.S., Ph.D., M.D.(Hon.); Biochemistry

Members Emeriti

OSWALD THEODORE AVERY, B.A., M.D., Sc.D., LL.D.; Medicine
ALFRED EINSTEIN COHN, A.B., M.D., Sc.D.; Medicine
RUFUS COLE, B.S., M.D., Sc.D.; Medicine
WALTER ABRAHAM JACOBS, A.B., A.M., Ph.D.; Chemical Pharmacology
LOUIS OTTO KUNKEL, B.S., A.B., A.M., Ph.D.; Plant Pathology
DUNCAN ARTHUR MACINNES, B.S., M.S., Ph.D.; Physical Chemistry
PETER KOSCIUSKO OLITSKY, M.D.; Pathology and Microbiology
WINTHROP JOHN VANLEUVEN OSTERHOUT, A.B., A.M., Ph.D., Sc.D.; General Physiology
PEYTON ROUS, A.B., M.D., Sc.D., M.D.(Hon.); Pathology and Microbiology
FLORENCE RENA SABIN, B.S., M.D., Sc.D., LL.D.; Pathology and Microbiology
HOMER FORDYCE SWIFT, Ph.B., M.D., Sc.D.; Medicine
CARL TENBROECK, A.B., M.D.; Animal Pathology
DONALD DEXTER VAN SLYKE, A.B., Ph.D., M.D.(Hon.), Sc.D.; Biochemistry
Guest of the Institute

EUGENE LINDSAY OPIE, A.B., M.D., Sc.D., LL.D.; Pathology and Microbiology

Associate Members of the Institute

ARMIN CHARLES BRAUN, B.S., Ph.D.; Plant Pathology
SAM GRANICK, B.S., M.S., Ph.D.; Biochemistry
FRANCIS OLIVER HOLMES, B.S., Sc.D.; Plant Pathology
ROLLIN DOUGLAS HOTCHKISS, B.S., Ph.D.; Pathology and Microbiology
REBECCA CRAIGHILL LANCEFIELD, A.B., A.M., Ph.D.; Microbiology
JOHN BROCKWAY NELSON, B.S., A.M., Ph.D.; Animal Pathology
KEITH ROBERTS PORTER, B.S., A.M., Ph.D.; Cytology
ALEXANDRE ROTHEN, Ch.E., Sc.D.; Physical Chemistry
THEODORE SHELLOVSKY, B.S., Ph.D.; Physical Chemistry
NORMAN RUDOLPH STOLL, B.S., M.S., Sc.D.; Animal Pathology
WILLIAM TRAGER, B.S., A.M., Ph.D.; Animal Pathology

Associates

EDWARD HAMBLIN AHRENS, Jr., B.S., M.D.; Medicine; Associate Physician to the Hospital
VINCENT GEORGE ALLFREY, B.S., A.M., Ph.D.; General Physiology
LILLIAN ELOISE BAKER, A.B., A.M., Ph.D.; Biochemistry
HSIANG-TUNG CHANG, B.S., Ph.D.; Physiology
MERRILL WALLACE CHASE, A.B., M.S., Ph.D.; Pathology and Microbiology
DOMINIC DONALD DZIEWIATKOWSKI, A.B., M.S., Ph.D.; Biochemistry
WILLIAM JOSEPH EISENMENGER, B.S., M.D.; Medicine; Resident Associate Physician
WERNER HAUSMANN, B.S., Sc.D.; Biochemistry
CHRISTOPHE HENRI WERNER HIRS, B.S., Ph.D.; Biochemistry
CARLTON CUYLER HUNT, Jr., A.B., M.D.; Physiology
RALPH BULKLEY LITTLE, V.M.D.; Animal Pathology
ROBERT BARCLAY McGHEE, A.B., M.S., Ph.D.; Animal Pathology
GEORGE EMIL PALADE, M.D.; Cytology
GERTRUDE ERIKA PERLMANN, Ph.D.; Physical Chemistry
HOWARD ALBERT SCHNEIDER, B.S., M.S., Ph.D.; Pathology and Microbiology
ELLIOTT NATHAN SHAW, B.S., Ph.D.; Biochemistry
JAMES RICHARD WEISIGER, A.B., A.M., Ph.D.; Biochemistry

Assistants

GUY THOMAS BARRY, B.S., Ph.D.; Biochemistry
ALEXANDER GORDON BEARN, M.B., B.S, M.D.; Medicine; Assistant Physician to the Hospital
DAVID HENRY BLANKENHORN, M.D.; Medicine; Assistant Physician to the Hospital

GEORGE CONSTANTIN COTZIAS, M.D.; Medicine; Assistant Physician to the Hospital

MARIE MAYNARD DALY, B.S., M.S., Ph.D.; General Physiology

KEITH RODNEY DUMBELL, M.B.,Ch.B., M.D.; Pathology and Microbiology

BURTON GIGES, B.S., M.D.; Medicine; Assistant Physician to the Hospital

ROGER LOUIS GREIF, B.S., M.D.; Medicine; Assistant Physician to the Hospital

ELIZABETH JOYCE HARFENIST, A.B., A.M., Ph.D.; Biochemistry

JAMES GERALD HIRSCH, B.S., M.D.; Pathology and Microbiology

WILLIAM INSULL, Jr., B.S., M.D.; Medicine; Assistant Physician to the Hospital

HERBERT JAFFE, B.S., Ph.D.; Biochemistry

MARGERIS ADOMAS JESAITIS, M.S., Sc.D.; Biochemistry

GEORGE ISRAEL LAVIN, B.S., Ph.D.; in charge of Spectroscopic Laboratory

KARL MARAMOROSCH, Ph.D.; Plant Pathology

ROBERT BRUCE MERRIFIELD, A.B., Ph.D.; Biochemistry

JAMES SLATER MURPHY, M.D.; General Physiology

SHIRLEY WILLIAM PELLETIER, B.S., Ph.D.; Chemical Pharmacology

CYNTHIA HAMBURY PIERCE, A.B., Ph.D.; Pathology and Microbiology

*CLAYTON RICH, Jr., M.D.; Medicine; Assistant Physician to the Hospital

RUTH SAGER, B.S., M.S., Ph.D.; Biochemistry

GASTON SAUVÉ, A.B., M.D.; Medicine; Assistant Physician to the Hospital

IRVING LEON SCHWARTZ, A.B., M.D.; Medicine; Assistant Physician to the Hospital

ROBERT JAMES SLATER, B.S., M.D.; Medicine; Assistant Physician to the Hospital

HERBERT STERN, B.S., M.S., Ph.D.; General Physiology

JOHN MORROW STEWART, B.S., M.S., Ph.D.; Biochemistry

ERNEST STURM; Pathology and Microbiology

HARRIS HERMAN TALLAN, A.B., Ph.D.; Biochemistry

IGOR TAMM, M.D.; Medicine; Assistant Physician to the Hospital

JØRN CHRISTIAN HESS THAYSEN, M.D.; Medicine; Assistant Physician to the Hospital

DAVID ARTHUR JOHN TYRRELL, M.B.,Ch.B., M.R.C.P.; Medicine; Assistant Physician to the Hospital

DAVID WALTER WEISS, A.B., Ph.D.; Pathology and Microbiology

HARRISON FREDERICK WOOD, A.B., M.D.; Medicine; Assistant Physician to the Hospital

NORTON DAVID ZINDER, A.B., M.S., Ph.D.; Pathology and Microbiology

Visiting Investigators

LAWRENCE BOGORAD, B.S., Ph.D.; Biochemistry

LENORA VIRGINIA BROWN, A.B., M.D.; Pathology and Microbiology

*On leave with the United States Naval Reserve
LEIGHTON EGGERTSEN CLUFF, M.D.; Medicine; Assistant Physician to the Hospital
STUART DUNSMORE ELLIOTT, A.M., B.S., M.D., D.P.H.; Medicine
DON WAYNE FAWCETT, A.B., M.D.; Cytology
WILLIAM JOSEPH KUHNS, B.S., M.S., M.D.; Medicine; Assistant Physician to the Hospital
GEORGE EDWARD MURPHY, A.B., M.D.; Medicine; Assistant Physician to the Hospital
ALEJANDRO CONSTANTINO PALADINI, D.B.C.; Biochemistry
SYAMAPRASAD RAYCHAUDHURI, B.S., M.S., D.PHIL.; Plant Pathology
GIUSEPPE REVERBERI, Dr.Nat.Sc.; General Physiology
CARL FRANZ ROBINOW, M.D.; Cytology
WERNER BERNARD SCHAFFER, M.D.; Pathology and Microbiology
JOHN KEITH SPITZNAGEL, A.B., M.D.; Pathology and Microbiology
FETHI TEZOK, M.D.; Medicine
HELEN SHARGEL WELLS, A.B., M.S., PH.D.; Animal Pathology
JEROME JAY WOLKEN, B.S., M.S., PH.D.; Cytology

ADMINISTRATIVE AND OTHER APPOINTMENTS

EDRIC BROOKS SMITH, B.S.; Business Manager
WALDO RAYMOND FLINN, A.B., M.B.A.; Assistant Business Manager
ERNEST WILLIAM SMILLIE, V.M.D.; Assistant to the Business Manager
CHARLES PETRZELKA; Bursar
ALICE NORINE LOCKIE, R.N.; Superintendent of the Hospital
GEORGINA MAY DREW, R.N.; Assistant Superintendent of the Hospital
STELLA ROSE HOFFMANN, R.N.; Assistant Superintendent of the Hospital
BERNARD LUPINEK; Superintendent of Maintenance
WILLETS HAVILAND SHOTWELL, JR., A.B., M.B.A.; Administrative Assistant
ANTHONY JOHN CAMPO, Ph.G.; Purchasing Agent and Pharmacist
FLORENCE MARIAN STEWART, A.B.; in charge of Publications
ESTHER JUDKINS, A.B., B.S.; Librarian
JULIAN ALEXANDER CARLILE; in charge of Illustration
CHRISTINE MCDONALD, R.N., B.S.; in charge of X-Ray Photography
AUDREY HYACINTH EVANS, A.B.; in charge of Media Preparation
MARGUERITE VAN OSTRAND PATMORE, R.N.; Medical Social Worker
VIRGINIA MINOT FOWLER, A.B., A.M.; Secretary to the Director of the Institute
HAZEL REED OLMSTEAD; Secretary to the Business Manager

[9]
Endowment

The Rockefeller Institute for Medical Research was founded in 1901 by Mr. John D. Rockefeller, as a philanthropic corporation under the laws of the State of New York. Since its beginning, as needs have arisen for buildings, equipment, and additional endowment, to permit more extensive investigations, gifts have very generously been made by Mr. John D. Rockefeller and Mr. John D. Rockefeller, Jr.

Bequests and Gifts

The opportunities for fruitful medical research are almost unlimited and potentially exceed the limits of any given endowment. On the other hand, individuals anxious to make donations that will promote medical research are often at a loss as to how to place funds so that they will be wisely expended. The organization and control of investigation in the Institute are in the hands of a Board of Scientific Directors, selected from the scientific leaders of the country; and donations accepted by the Institute are expended under their direction with the same care as that devoted to the expenditure of the income from the original endowment. Donors, therefore, who are interested in contributing to scientific medical investigation may have confidence that the Scientific Directors will make a wise use of their donations. The Institute is glad to receive such donations when the Directors and Trustees are satisfied that it can, consistently with its existing policies and commitments, do justice to the purposes of the donors. At the present time the Institute is administering several gifts made for the promotion of cancer research. Other gifts made for the Institute's general purposes have been helpful in carrying on its work.

Purposes

The purposes of the Rockefeller Institute are set forth in its charter, which states that:

"The objects of said corporation shall be to conduct, assist and encourage investigations in the sciences and arts of hygiene, medicine and surgery, and allied subjects, in the nature and causes of disease and the methods of its prevention and treatment, and to make knowledge relating to these various subjects available for the protection of the health of the public and the improved treatment of disease and injury. It shall be within the purposes of said corporation to use any means to those ends which from time to time shall seem to it expedient, including research, publication, educa-
tion, the establishment and maintenance of charitable or benevolent activities, agen-
cies or institutions appropriate thereto, and the aid of any other such activities,
agencies or institutions already established or which may hereafter be established.”

Development

The Rockefeller Institute was conceived; not by physicians or scientists, but rather by laymen who studied
the state of medical knowledge at the end of the nineteenth century and
concluded that the time was favorable for the establishment in the United
States of an institute devoted exclusively to medical research, just as
institutions devoted to physical or chemical research might be founded.

In the United States before 1900 the growth of medical science had
not kept pace with that of the physical sciences, despite the fact that
research in medicine had been carried on in universities at a constantly
increased rate. The conclusion reached by Mr. Frederick T. Gates,
acting as adviser to Mr. Rockefeller, was, therefore, that “medicine
could hardly hope to become a science until it should be endowed, and
qualified men be enabled to give themselves to uninterrupted study and
investigation, on ample salary, entirely independent of practice.” This
view was accepted by Mr. Rockefeller, who made the initial contribution
toward the eventual permanent establishment of The Rockefeller Institu­
tute for Medical Research.

The original gift, amounting to $200,000, was in 1901 placed in the
hands of a Board of Directors, composed of William H. Welch, President;
T. Mitchell Prudden, Vice-President; L. Emmett Holt, Secretary;
Theobald Smith, Christian A. Herter, Hermann M. Biggs, and Simon
Flexner. This gift was not made for the immediate purpose of building
an institution for medical research, but was to be used by a group of
scientifically trained medical men to ascertain the resources in adequately
trained younger men of the universities engaged in the pursuit of medical
research. It was to be awarded in grants and fellowships and expended
within a period of ten years. During this period, and in this way, it
was hoped that more precise knowledge would be obtained concerning
the advisability of establishing in the United States an independent
institute for medical research. This information was secured more
quickly than had been anticipated, so that early in 1902 the conception
of a research laboratory to be located in New York City had taken form
in the minds of the scientific directors, and met with Mr. Rockefeller’s
approval.

[11]
The principles of organization of the research laboratory which constituted the beginnings of the present Rockefeller Institute have continued essentially unchanged. They were, briefly, that there should be a Board of Scientific Directors responsible for the appointment of the Scientific Staff and for the general policies of scientific investigations carried on, while the general direction of the scientific work was to be entrusted to a Scientific Director, who was himself an investigator and in intimate contact with other investigators. Each investigator was to be accorded complete freedom in the pursuit of problems within his particular field.

It was apparent that Mr. Rockefeller's initial gift necessitated that the operation of the original laboratory in New York should be on a limited scale. Accordingly a small building was rented at 127 East 50th Street, equipped for investigations in pathology, physiology, pharmacology, and biological chemistry, and opened on October 15, 1904. The original scientific staff consisted of Simon Flexner, pathologist and Director, with whom were associated Hideyo Noguchi, Eugene L. Opie, and J. E. Sweet, pathologists; Samuel J. Meltzer, physiologist and pharmacologist; and P. A. Levene, biological chemist.

The results achieved with grants given in aid of research, and in the first small laboratory, proved to be so encouraging that a tract of land was purchased by Mr. Rockefeller overlooking the East River at 66th Street, upon which was erected a modern laboratory. In order to provide both for the erection of the laboratory and for its cost of operation, Mr. Rockefeller made an additional gift to be expended and not reserved in part as endowment. This laboratory, known as the Central Laboratory, was opened in 1906, and provided suitable space for the study of the above subjects together with experimental surgery, and, later, experimental biology.

The need for a hospital attached to the Institute, in which disease in man could be investigated under as favorable conditions as possible, was felt early, inasmuch as investigations had been conducted only in the laboratories, and access to patients suffering from disease had to be secured in a small way at hospitals in the city. In 1908 and shortly thereafter Mr. Rockefeller made gifts for the purpose of erecting a main hospital of sixty beds, and an isolation pavilion, of nine beds, designed for the study of infectious diseases. The hospital was opened in 1910 with Rufus Cole as Director. At that time Mr. Rockefeller provided a
suitable endowment for the needs of the Institute as then existing. The
isolation pavilion was converted to a nurses' residence in 1950. A new
wing of the hospital was opened in 1951, and the interior of the old part
is being rebuilt in order to provide more spacious and modern facilities
for the same number of patients. In 1937 Dr. Cole retired as Director
of the Hospital and was succeeded by Dr. Thomas M. Rivers.

The principles of organization of the hospital were, first, that the
number of diseases studied at any one time would be limited and only
patients suffering from one or another of the diseases under investigation
would be accepted; second, that all the scientific staff was to devote its
entire time to the duties of the hospital; third, that the work of the hos­
pital staff should consist not merely in observational studies, but in ex­
perimental studies equally; and fourth, that no charge was to be exacted
from the patients for services rendered. These principles have not been
departed from in the forty-two years during which the hospital has been
in operation.

In 1910, with the added endowment and the opening of the hospital,
the powers of the Corporation were increased and its membership was
enlarged to include the members of a new Board of Trustees as well as
the members of the original Board of Directors, the name of which was
changed at that time to the Board of Scientific Directors. The new
Board of Trustees was composed of two groups: one representing the
business or fiscal interests of the Institute and the other the scientific
interests. The former group consisted of Frederick T. Gates, as Presi­
dent, John D. Rockefeller, Jr., and Starr J. Murphy; and the latter
group of William H. Welch and Simon Flexner. Owing to death and
other circumstances, the personnel of the Trustees has changed, and at
the present time consists of nine members, with David Rockefeller as
President.

Up to 1914 the Rockefeller Institute was located wholly in New York
City and consisted of laboratories and a hospital. In that year a De­
partment of Animal Pathology was created, and Theobald Smith was
chosen Director. A suitable country location, about three miles from
Princeton University, was secured, on which laboratories and stables for
animals were erected. This department was created in order to provide
facilities for the study of the comparative aspects of the pathology of
disease in various animal species, especially in the more valuable domestic
animals, and in order to bring to light such processes as are especially clear
in animals but obscure or difficult of access in human beings. Following the retirement of Dr. Theobald Smith, as Director, in 1930, Dr. Carl TenBroeck became Director until his own retirement in 1951.

In 1931 the department at Princeton was extended to include a Laboratory of Plant Pathology, and the combined laboratories became known as the Department of Animal and Plant Pathology. Through the addition of plant pathology the Rockefeller Institute provided in one organization for the study of disease as it occurs in all the main orders of living things.

While experience has fully justified the program for the comparative study of disease, the advantages to be gained by daily association of the investigators in the closely related parts, and the growing need in all sectors of investigation for the ready availability of elaborate specialized techniques, have made it desirable in the interest both of effectiveness and economy of research, to integrate the parts of the Institute. At the present time the work on animal and plant pathology is established in parallel with the other branches of medical research in the Department of the Laboratories in New York City.

In 1935 Dr. Simon Flexner retired from the directorship of the Institute and was succeeded by Dr. Herbert S. Gasser.

**ORGANIZATION**

**Administration**  
The Institute’s charter provides for a Board of Trustees and a Board of Scientific Directors. The Board of Trustees, of which two members are appointed by the Scientific Directors from their own number, is charged with the maintenance and care of the endowment and property of the Institute. Income from endowment, after the charges on capital have been paid, is available for expenditure by the Board of Scientific Directors. The Board of Scientific Directors, acting through the Director of the Institute, has control of all the scientific work and of the administration of the departments of the Institute. Its stated meetings are held quarterly. The expenditures are made under its direction in accordance with an annual budget approved by a Budget Committee consisting of three members of the Board of Scientific Directors and two members of the Board of Trustees. Of the three members of the Budget Committee chosen by the Board of Scientific Directors at least one shall also be a member of the Board of Trustees.

The Trustees of the Institute, who are the custodians of its property,
and the Scientific Directors, who have unrestricted charge of all phases of its scientific work, together constitute the Corporation. The Corporation meets at least once a year to receive reports from the Trustees and Scientific Directors, who consider together, from a common standpoint, the affairs of the Institute as a whole. This organization of the Governing Boards has fostered the aims of the Institute in a most gratifying way, giving as it does to the Scientific Directors the advantage of wise and sympathetic counsel in the relationships of the institution to the community, and affording to the Trustees opportunity to share in the problems, outlooks, and successes which are the inspiration of the scientific staff.

The routine administration of the Institute is in charge of an Executive Committee of the Board of Scientific Directors which acts chiefly through the Business Manager. The fiscal year begins July 1.

Departments of the Institute

There are two Departments of the Institute: the Department of the Laboratories, and the Department of the Hospital. At the head of each of these Departments is a Director, who is also a member of the Scientific Staff. The departmental Directors are appointed by the Board of Scientific Directors, and the Director of the Institute by the Corporation.

The Department of the Laboratories deals with the problems of disease in their physiological, pathological, microbiological, chemical, and physical aspects. Fullest use is made of the experimental method in the investigation of whatever may contribute to a better understanding of disease processes, whether the latter occur in man, animals, or plants. The Department of the Hospital studies disease as it actually appears in human beings, facilities being provided not only for scientific observation and treatment of patients, but also—through experiments on animals—for solution of the problems arising from these clinical observations.

In the Departments of the Institute separate laboratories have been organized under the guidance of Members or Associate Members.

The Department of the Laboratories

The Department of the Laboratories, which was organized in 1905, is directed by Dr. Herbert S. Gasser. In this Department, investigations are carried on, at the present time, in the following scientific fields:
Chemistry, Pathology, Physiology, and Cytology. These are conducted by the following staff groups.

Chemistry

Laboratories of Biochemistry are conducted by Dr. Craig, in association with Drs. Hausmann, Weisiger, and Harfenist; by Dr. Goebel, in association with Drs. Barry and Jesaitis; by Drs. Moore and Stein, in association with Drs. Baker, Hirs, and Tallan; by Dr. Woolley, in association with Drs. Shaw, Merrifield, and Stewart; and by Dr. Granick, in association with Dr. Sager.

Laboratories of Physical Chemistry are conducted by Dr. Longsworth, in association with Drs. Shedlovsky and Perlmann; by Dr. Rothen; and by Dr. MacInnes, Member Emeritus.

A Laboratory of Chemical Pharmacology is being conducted by Dr. Jacobs, Member Emeritus, in association with Dr. Pelletier.

Pathology

Laboratories of Pathology and Microbiology are conducted by Dr. Dubos, in association with Drs. Hotchkiss, Chase, Hirsch, Pierce, and Weiss; by Dr. McMaster, in association with Mr. Sturm; by Dr. Schneider, in association with Dr. Zinder; by Dr. Olitsky, Member Emeritus; and by Dr. Rous, Member Emeritus, in association with Dr. Dumbell.

Laboratories of Animal Pathology are conducted by Dr. Shope; by Dr. Nelson; by Dr. Stoll; and by Dr. Trager, in association with Dr. McGhee.

Laboratories of Plant Pathology are conducted by Dr. Holmes; and by Dr. L. O. Kunkel, Member Emeritus, in association with Drs. Braun and Maramorosch.

Physiology

Laboratories of Neurophysiology are conducted by Dr. Lloyd, in association with Dr. Hunt; and by Dr. Lorente de Nó, in association with Dr. Chang.

Laboratories of General Physiology are conducted by Dr. Kunitz; and by Dr. Mirsky, in association with Drs. Allfrey, Daly, and Stern. A laboratory is also conducted at the University of California by Dr. Northrop, in association with Dr. J. S. Murphy.
Cytology

A Laboratory of Cytology is being conducted by Dr. Porter, in association with Dr. Palade.

The Department of the Hospital

The Department of the Hospital is directed by Dr. Thomas M. Rivers, and was established as a part of the Institute in 1910, in order that experimental investigations which are carried on in the Department of the Laboratories could be complemented by the study of certain diseases as they actually occur in man.

The particular diseases studied in the Hospital vary from time to time, the choice of problems being determined to some extent by the special interest and training of the scientific staff. The staff of the Hospital is divided into several groups each of which is engaged in studying a special class of diseases, the investigation of which requires the employment of the methods of the basic sciences. The interests of a member of a particular group are not necessarily confined to the disease being studied by his group. For example, a physician studying metabolic diseases may investigate the metabolic disturbances occurring in patients with heart disease or acute infections.

The groups of diseases at present under investigation in the Hospital and the names of workers engaged in the study of each of them are as follows:

Acute Respiratory and Viral Diseases

Drs. Horsfall, Tamm, and Tyrrell.

Rheumatic Fever

Drs. McCarty, Lancefield, Cluff, Kuhns, G. E. Murphy, and Wood, and Dr. Swift, Member Emeritus.

Cardiovascular Diseases

Drs. Dole, Ahrens, Blankenhorn, Cotzias, Insull, Schwartz, and Thaysen.

Endocrine Disorders, Excluding Diabetes Mellitus

Drs. Archibald, Dziewiatkowski, Greif, Jaffe, and Sauvé.
Acute and Chronic Diseases of the Liver

Drs. H. G. Kunkel, Eisenmenger, Bearn, Giges, and Slater.

Admission of Patients to the Hospital

The Hospital provides accommodation for a limited number of patients, and it has been so organized that the most modern and approved methods of treatment can be adequately employed. Each physician has but a few patients under his care in order that a considerable portion of his time may be given to investigation. The Hospital employs none but graduate nurses.

The work of the Hospital at a particular time is limited to a small number of subjects; bulletins are issued from time to time stating the forms of disease then the subject of study. Only patients suffering from one or another of these diseases are admitted for treatment. They are admitted by the Resident Associate Physician, to whom they are referred by physicians or hospitals, or to whom they may apply directly. While making the fullest use of its opportunities for observation and study, the Institute recognizes at all times the paramount right of the patient to receive the most effective treatment within the power of the attending physicians. A patient does not impair that right by the voluntary character of his application for admission.

Under the By-Laws of the Corporation, no charge for professional care or service rendered, or for board or lodging, is to be made to persons treated at the Hospital.

General Statement

The departments of the Institute are organized for research only. Under normal conditions no provision is made for the enrollment of individuals or classes for formal instruction in the medical sciences or in laboratory or clinical methods. Thus the Institute absolves its staff from the necessity of devoting time and energy to formal teaching or to the consideration of subjects and problems chosen for reasons other than because of their value and promise for the advancement of science.

The scope of the Institute's work is wider than the study of problems whose solution has an immediate application to human pathology. It has, in fact, been the principle of the Institute's organization that it can best serve medical science by devoting a great deal of attention to the
investigation of fundamental biological, physical, and chemical subjects. These aspects of science, as well as those of direct clinical importance, have been constantly under investigation, and together with problems of general biological interest, have largely occupied certain of the scientific staff and have used a considerable share of the Institute's annual budget.

It is not the aim of the Institute to perpetuate the lines of investigation in which it may engage, or even Departments or Laboratories, should the usefulness or promise of these at any time become doubtful, either from changes in the requirements and outlooks of science, or from lack of leaders of vision or achievement. On the other hand, the elucidation of fundamental problems may proceed under favorable conditions and with adequate support for an indefinite period, unhurried and unhindered by the urgency of obviously practical or immediate results. The organization of the Scientific Staff of the Institute is thus flexible and adaptable to the ever shifting requirements of research, so that at any time its Directors may alter the emphasis of its work, and focus its various resources upon different aspects of complex problems.

While the various phases of research which are being carried forward at the Institute are more or less independently conducted in the several Departments and Laboratories, it is aimed as far as is possible, through coordination and cooperation, to make them mutually helpful and stimulating. Thus through frequent symposia, the common services of publication, library, illustration, and other accessory services, and the lunch room shared by the scientific staff, a helpful community of interest is maintained.

Appointments to the Scientific Staff are made by the Board of Scientific Directors, upon recommendation of the Director of one of the Departments. They are held at the pleasure of the Board for a term not exceeding the period specified. The appointment of a Member of the Institute is without limit of time; the appointment of an Associate Member is for a term of years; all other appointments are for a term not exceeding one year, unless otherwise specified.

The following grades are fixed by the rules of the Board: Member of the Institute, Associate Member of the Institute, Associate, Assistant, and Fellow. The clinical staff of the Hospital may have in addition to the appropriate Institute titles, as above, the following titles
indicating their special functions: Physician-in-Chief to the Hospital, Physician, Associate Physician, Assistant Physician, Resident Associate Physician, and Senior Assistant Physician.

Applications for appointment may be made at any time. Blank forms of application are furnished on request. Appointments are ordinarily made only as vacancies occur. They may be sought for the purpose of permanent or indefinite association with the Institute, or for the purpose of temporary association with the Institute with one of the following objects: (1) experience in methods of investigation generally; (2) training in a special line of investigation; or (3) opportunity to work more or less independently on a particular problem which may be the subject of study at the time. The qualifications for appointments to the scientific staff include preliminary training such as would be represented by an M.D. or a Ph.D. degree and, in addition, a knowledge of research, or a training such as would ordinarily be appropriate to the higher degrees in the biological or physical sciences.

The Institute requires all who serve on its scientific staff to give full time to the work, permitting them to pursue no gainful occupations outside of its organization and paying them a stipend fixed with reference to their complete devotion to whatever may be their particular line of investigation. No part time workers are accepted.

All staff appointees are paid investigators with the exception of a number of visiting investigators and special appointees, usually persons receiving fellowships awarded by various institutions in the United States and abroad. Foreigners who come to the Institute under fellowships are ordinarily privileged to enter the United States as “students” under the Immigration Laws. Visiting investigators give their entire time to the scientific work on which they are engaged, under the direction of one of the heads of laboratories of the Institute. Volunteer investigators wishing to pursue individual subjects of research foreign to the investigations being carried on in the laboratories of the Institute are not, as a rule, acceptable. Language plays no part in the eligibility of visiting investigators. They are expected to be self-supporting, but there are no laboratory charges imposed either for space or materials.

**Technical Employees**

The Institute employs a group of men and women who act as technical assistants to the scientific staff. This group is largely made up of technicians, skilled helpers,
and helpers. The technicians have had training equivalent to a B.S. degree, or considerable experience in special laboratory technique. The skilled helper and helper groups are composed mainly of young men and women who are high school graduates and who have a special interest in scientific work. Applications for employment may be filed with the Assistant Business Manager.

**Services**

**Auxiliary to Research**
The organization of the Institute provides for the maintenance of a series of Auxiliary Services for the scientific staff, thus relieving the latter of such personal routine as can be wisely delegated to specially trained persons. The following are now in operation: Publication, Library, Illustration, Purchase and Supply, Culture Media and Glassware Preparation, X-Ray, Animal House, and Instrument-Making. Also of service to the scientific staff, as well as in maintenance work, are the Power House, Machine Shop, Carpenter Shop, and Paint Shop.

**Discoveries and Inventions**
All discoveries and inventions made by any person while receiving compensation from the Institute, or while using the facilities of the Institute, become the property of the Institute, to be placed by it at the service of humanity in accordance with the beneficent purposes of the founder.

**PRESENT SCOPE OF THE SCIENTIFIC WORK**
As previously stated, in the organization of the scientific work of the Institute the principle has been recognized that the ultimate purposes of medical science may be greatly served by the study of fundamental biological, chemical, and physical problems. It will thus be seen that the scope of the Institute's work is broader than the study of problems whose solution would have an immediate application in the treatment and prevention of diseases of man, animals, and plants.

**The Department of the Laboratories**
Dr. Herbert S. Gasser, Director of the Institute, is also Director of the Department of the Laboratories, in which investigations are being carried on at the present time in the following scientific fields: Chemistry, Pathology, Physiology, and Cytology.
Dr. Craig and his associates are engaged in structural investigations of the higher polypeptides and in the development of techniques which will permit more precise study of the type of large molecular weight substances encountered in biochemistry. The approach in principle is not different from that of classical organic chemistry as applied to smaller molecules. However, because of the fragile nature of the substances, emphasis is placed on the development of countercurrent distribution and its supporting techniques for separating mixtures, proving purity, determining molecular weights, degradative studies, etc. Naturally occurring lipid substances are also included in the program.

Dr. Goebel and his associates are studying the bacteriophages with the aim of elucidating the chemical nature of the substances distributed on the surface of susceptible microorganisms which specifically combine with bacterial viruses at the time the infectious process is initiated. In the case of certain enteric microorganisms these substances have been characterized as lipomucoprotein-carbohydrate complexes. Not only do these substances confer type specificity upon the bacterium, but they also exhibit highly specific antiviral properties, for they inactivate in vitro all of those bacteriophages which attack the particular bacterial cell from which the lipomucoprotein-carbohydrate is obtained. The specificity of these substances has been found to be dependent upon the chemical constitution of the carbohydrate moiety of the complex. It has been learned that similar complexes, derived from virus-resistant mutant cells, differ markedly in chemical structure from the complexes isolated from susceptible microorganisms and are devoid of antiviral properties.

In addition to these problems, Dr. Goebel's laboratory is also investigating the question of lysogenicity, paying particular attention to the chemical and immunological nature of the virus which reproduces symbiotically with a certain strain of Bacillus megatherium. They are also engaged in a study of the coliphage T4, during its early stages of reduplication in the infected host cell. A newly devised method permits lysis of bacterial cells within a few minutes after infection and has enabled studies to be made of the relationship between the biochemical and immunological properties of immature phage and those of mature infectious bacteriophage.
Drs. Moore and Stein and their associates are engaged in studies on
the biochemistry of proteins, peptides, and amino acids. Methods for
the purification of proteins by chromatography on ion exchange resins
have been developed for some of the more stable enzymes, such as ribo­
nuclease and lysozyme. Chromatographic techniques already evolved
permit accurate determination of the amino acid composition of purified
protein preparations. The fractionation of mixtures of peptides is being
studied as a groundwork for detailed investigations of the structural
pattern of protein molecules.

Ion exchange chromatography is being applied to the determination
of both the free and the combined forms of amino acids in blood plasma
and urine. Information is being accumulated on the chemical constitu­
tion of these fluids in normal individuals and in subjects exhibiting aber­
rations in amino acid metabolism. Particular attention has been given
to Wilson’s disease (hepatolenticular degeneration) and to cystinuria.
This phase of the work is directed toward a fuller understanding of the
metabolic rôle of amino acids and peptides.

Dr. Woolley and his associates are studying the nature and modes of
action of some of the vitamins and allied compounds of metabolic im­
portance. To investigate the nature of some of the previously unknown
vitamins work is being conducted towards the isolation and determina­
tion of the structure of strepogenin. This is a substance which is neces­
sary for normal growth of several kinds of microorganisms and of animals.
It is a constituent of some pure proteins and is probably a peptide con­
taining glutamic acid as well as several other amino acids. Crystalline
insulin, the richest known source, is being degraded and from among the
fragments the vitamin is being concentrated. In addition to information
about strepogenin these studies are giving an insight into some of the
features of the exact chemical structure of insulin and several other
proteins.

Much of the work dealing with the mode of action of the vitamins is
being done through the development of antimetabolites. These are sub­
stances closely related in chemical structure to various vitamins, hor­
mones, and other metabolites, but having the property of producing in
living things the signs of deficiency of these metabolites. Such antago­
nists have been produced for each of the several water-soluble vitamins,
for some of the fat-soluble ones, for hormones such as thyroxine, and for
metabolites such as purines and amino acids. By use of these agents it
has been found possible to produce specifically in many kinds of living
matter the signs of deficiency of the metabolites. By using such an-
tagonic compounds the rôles in metabolism of some vitamins are being
studied. Furthermore, these agents represent new series of drugs or
pharmacological agents and as such they are being investigated in efforts
to learn something of theoretical and possibly practical importance in
pharmacology. In order to learn what kinds of alteration in structure
should be made so that metabolites can be converted into these spe-
cific pharmacological agents, an extended series of investigations is be-
ing made in which many kinds of compounds related in various ways
to individual vitamins and hormones are prepared and studied for effects
on diverse living organisms.

Several of these antimetabolites are proving to be useful in the study
of living processes. This is because they are highly specific inhibitors of
defined biochemical reactions. When these compounds are given to ex-
erimental animals or to microorganisms, individual reactions can be re-
tarded without influencing other unrelated processes. In this way it has
been possible to investigate otherwise obscure aspects of metabolism and
growth.

Pathogenic microorganisms occasionally synthesize specific toxic sub-
stances which seem to act as antimetabolites which injure the host.
This phenomenon is being studied particularly in microorganisms which
cause disease in plants. At the present time the pathogenic toxin re-
sponsible for wildfire disease of tobacco is under study. This poisonous
product of the bacterial invader can be counteracted specifically by
methionine. The substance has been isolated in pure condition and
shown to be a simple derivative of a new amino acid. It is felt that the
toxin will prove to be a structural analog of methionine and that it may
act as an antimetabolite of this important substance.

Dr. Granick and an associate are investigating the biosynthetic path-
ways of porphyrin synthesis. Using x-ray mutants of the green alga,
Chlorella, it has been possible to isolate a number of intermediate com-
pounds along this pathway. It has been found that protoporphyrin is
the common precursor molecule from which arise the two major groups
of protoplasmic pigments, the hemes and the chlorophylls. The hemes
arise by the insertion of iron into the protoporphyrin molecule to form
the prosthetic group of hemoglobin and respiratory enzymes. The chloro-
phyll pigments arise by insertion of magnesium into the protoporphyrin
molecule; then in a series of steps this molecule is converted to chlorophyll.
The study of the biosynthesis of the porphyrins is being pursued not only on account of its interest from the physiological viewpoint, but also on account of the possibility of its affording an approach to the study of the biochemical evolution of protoplasm. Arising from the studies of chlorophyll synthesis, the working hypothesis has been proposed that "biosynthesis recapitulates biogenesis," that is, the steps along this biosynthetic chain represent, on a molecular level, the steps in the evolutionary development of this chain.

Current studies involve a search for porphyrins in nature that may indicate evolutionary trends, isolation and analysis of various heme pigments of heart muscle, and a study of the genetic controls of porphyrin synthesis in a cytoplasmic body, the chloroplast.

*Physical Chemistry*

Dr. Longsworth and his associates are studying the physical chemistry of aqueous solutions of salts, amino acids, and proteins with the aid of methods involving electrophoresis, diffusion, and galvanic cells.

In order to increase the precision with which mixtures of proteins can be analyzed, both the theory and practice of the moving boundary method for the electrophoresis of charged particles in solution are being investigated. As an aid in the estimation of their molecular weights the diffusion of amino acids, peptides, and proteins is also being studied. Precise optical procedures based upon the interference of light are being adapted for use in these investigations.

The electrophoretic method is being used both as an analytical and as a preparative tool in the study of slightly modified proteins. These are obtained with the aid of enzymes whose attack on specific linkages in the molecule leaves the protein relatively intact. Chemical and chromatographic methods are also used in determining both the nature of the fragments that are liberated in these reactions and their points of attachment to the protein.

Electrophoresis equipment is also maintained for the use of other Institute investigators whose work may require this tool.

New types of galvanic cells involving proton transfer are being studied in an effort to establish mechanisms whereby the free energy of acid-base reactions can be made available directly as electrical work. Unlike the conventional galvanic cells, in which oxidation and reduction accompany
the transition from electronic to ionic conduction at the metal-solution interface, those under investigation utilize materials, e.g. certain glasses and liquids, in which the proton serves as the conductor. Since such conduction is more likely to occur in living matter than electronic, i.e. metallic, conduction, it is to be expected that these studies will aid in the understanding of bioelectric phenomena.

Dr. Rothen is studying specific long range action between biologically important macromolecules. He has shown that multilayers of antigen deposited on metal slides can adsorb homologous antibodies in spite of a thin blanket of inert material covering the antigen. Interactions have also been observed through thin blankets between substrates and enzymes. The orientation of the substrate layers plays an important part in determining the maximum thickness of blanket through which trypsin action can occur. It has been found that substrate layers, after being submitted to the action of a weak magnetic field, are protected against trypsin action by a thinner blanket than if the layers had not been influenced by the field. The very weak field needed indicates that cooperative phenomena are involved and that the molecules become oriented as a whole assembly. These phenomena are under investigation at the present time.

A Spectroscopic Laboratory is conducted by Dr. Lavin, in which a central service for spectroanalysis is maintained for various laboratory groups throughout the Institute.

Dr. MacInnes, Member Emeritus, is studying the effect of centrifugal force on the potentials of simple galvanic cells. The method is providing data which, with the aid of density determinations, can be interpreted to yield transference numbers and ionic mobilities. The importance of the method lies in its application to non-aqueous solutions, for which the other available methods are not, in general, applicable. The density measurements are being made by utilizing a magnetic float procedure of very high sensitivity.

The program of research outlined is based on the fact that much of physiology derives from knowledge of the properties of solutions. Owing to many investigations in recent years the knowledge of aqueous solutions is extensive, although not yet complete. Very much remains to be done for other solvents than water, some of which are of great biological importance. However, to study such materials it is necessary to deal
first with solvents, such as alcohols, which impose fewer experimental difficulties.

A study of the iodine coulometer is being made for the purpose of redetermining the value of the Faraday equivalent. This involves the precise measurement of electric current against primary standards, and the determination, with high accuracy, of the iodine released or absorbed at the electrodes of the coulometer.

Chemical Pharmacology

Dr. Jacobs, Member Emeritus, and an associate are engaged in the study of the chemistry of natural products which are of pharmacological significance. Work is in progress on the aconite alkaloids and on the veratrine bases in order to determine their structures and the structural interrelationships among the individual alkaloids, so that through knowledge of these structures light may be shed upon the basis of their powerful pharmacodynamic actions.

Pathology

Pathology and Microbiology

Dr. Dubos and his associates are studying the structure and properties of bacteria in their relation to the production of disease. It is possible to study microorganisms by physiological and chemical methods analogous to the ones used for the investigation of higher forms of life, and the information thus obtained provides a rational basis for the sciences of pathology, immunity, and chemotherapy.

During recent years special emphasis has been placed on the problem of tuberculosis. One phase of the work deals with the growth requirements of tubercle bacilli, and with the chemical nature and biological properties of their components and products. The findings have led to the development of new types of culture media which can be used for the bacteriological diagnosis of the disease. There has been discovered a new serological reaction which permits a laboratory detection of the activity of the tuberculous process by the use of small amounts of the patient's blood. Much progress has been made towards identification of the cellular component of virulent tubercle bacilli to which they owe their pathogenic properties.
Another aspect of the study of tuberculosis is concerned with the factors that permit most human beings to resist infection under normal circumstances. Certain constituents of normal tissues have been found to inhibit the multiplication of tubercle bacilli and even to cause their destruction; the chemical nature of these constituents is under study as well as the part that they play in natural resistance to infection. An analysis has been undertaken of the effect of the nutritional state on resistance to the disease. Finally, studies are in progress to determine the mechanism of acquired immunity to tuberculosis with the hope that it will be possible to separate from dead tubercle bacilli a non-toxic substance that can be used for the immunization of human beings.

Work is also directed to the biochemical and physiological mechanisms involved in the experimental modification of inheritance in bacteria. In this process, known as transformation, purified deoxyribonucleic acid fractions, extracted from one strain of bacterial cells and added to cultures of a different strain, are able to induce in the latter the appearance of permanent characteristics identical with some of the inheritable properties of the strain furnishing the extract.

Investigations in experimental allergy are being carried out, particularly in relation to the development of hypersensitivity to simple chemical compounds (certain types of drugs for example) and to tuberculin. Study of factors affecting the production and prevention of the allergic state, including the rôle played by lymphoid cells in development of the allergic state and in the formation of antibodies, may be expected to throw light on the relation of the sensitization process to various aspects of immunology.

Dr. McMaster and an associate are engaged in a study of antibody formation, and are endeavoring to determine the sites from which the initial stimuli to antibody production arise. For this purpose various tracer antigens, among them some deep blue azoproteins, are being employed to detect which organs and what types of cells store antigen immediately after its introduction into the body. Studies upon the subsequent fate of injected antigens are indicating that antigens may persist within certain tissues far longer than is generally supposed; and an investigation of the matter is under way to throw light upon the mechanisms involved in prolonged antibody formation, a phenomenon that has no adequate explanation.

Dr. Schneider and an associate are engaged in studies in experimental
epidemiology. The problem of the genesis of epidemics of infectious disease is being investigated from the standpoint of the physiology of the host, especially as it is modified by diet. By use of population models of defined genetic composition, both of host and of pathogen, it has been possible to define the biological circumstances in which nutritional forces can operate in altering resistance and susceptibility to infectious disease. Vitamin-like compounds are being isolated from natural foodstuffs which can improve resistance.

Dr. Olitsky, Member Emeritus, and an associate are studying neurotropic viruses and the diseases induced by them, especially the so called encephalitis viruses and the viral encephalitides of man. Their chief interests are: the mechanism of immunity in these infections, diagnostic methods, the practice and the principles underlying such laboratory procedures as virus neutralization, complement fixation, and hemagglutination, and the differences between non-specific resistance and true immunity characterized by the presence of specific antibody. Their investigations include the influence of age and route of infection upon the development of the immune response, resistance induced by interference of one virus with the action of another, and the prevention and treatment of experimental disease through the use of specific and non-specific methods. Equine encephalomyelitis, Russian Far East encephalitis, and Japanese B encephalitis have been the viruses found to lend themselves most conveniently to these studies.

Several years ago a strain of poliomyelitis virus (MEF1) of the Lansing type was isolated in the laboratory. Originally it was adapted to adult mice. Recently it has been adapted by special methods to newborn mice. The brains of these infected newborn mice have been found to be a much more favorable source of antigen for use in a complement fixation test than those of infected adult animals. With the use of an antigen prepared from them, it has been possible to develop a specific test for detection of infection with poliomyelitis virus. Further studies to ascertain the range of the application of the test are in progress.

Dr. Rous, Member Emeritus, and an associate are at work with two aims in mind, to study further the successive neoplastic alterations which culminate in cancer, and to learn more about the causation of tumors as a class.

Experiment has already made plain that the conversion of a normal cell into a tumor cell and the multiplication of the latter into a perceptible
mass are processes brought about and conditioned by very different influences. Often cells become neoplastic yet form no tumor; and step-like, cellular changes, largely subthreshold in character, yet essentially neoplastic, are responsible for many of the cancers which emerge to view. Now it has been found that some of these changes, entail such slight deviations from the normal as only to be rendered perceptible by means of special procedures. Work on this theme is in progress.

The demonstration that urethane, when injected into pregnant mice, causes their young to have pulmonary tumors within a few days of birth has led to a search into the factors determining and conditioning such growths.

The relation of the rabbit virus producing epidermal papillomas to the carcinomas secondarily deriving therefrom has been under study for some years. It seems likely that one can learn something of carcinogenesis in general through intensive scrutiny of the cellular disturbances set in train by the virus.

Animal Pathology

Dr. Shope is conducting experiments on the epidemiology of various virus diseases. His efforts are directed mainly towards an elucidation of the mechanisms of masking and latency, and a study of the means by which viruses survive outside their apparent hosts between disease outbreaks.

Dr. Nelson is continuing his studies on the native respiratory diseases of rodents with particular emphasis on endemic pneumonia and infectious catarrh. He has under observation a pneumonia-free colony of albino rats. He is also working with a rodent form of infectious hepatitis, an acute highly fatal disease of virus etiology which appeared in albino mice of the Princeton strain during the passage of lymphocytic leukemia.

Dr. Stoll is studying conditions favoring axenic development of helminths in vitro. Neoplectana glaseri, an oxyurid parasitic in the grub of the Japanese beetle, has been cultured through its life cycle in liquid media with the aid of an extract derived from mammalian liver. This has permitted defining a number of other physicochemical factors that tend to foster successful culture of this organism. The study is being extended to other species.

Dr. Trager and an associate are investigating the physiological rela-
tionships between intracellular parasites and their hosts at both the cellular level and the level of the intact host organism. Attention is being devoted especially to the nutritional requirements of two species of intracellular protozoa and to factors conditioning cellular susceptibility to one of these. An avian malaria parasite can now be maintained extracellularly in culture for several days in a medium the most important constituent of which is a concentrated extract of duck erythrocytes. The extracellular survival and development of the parasite are further favored by the addition to the medium of a number of substances concerned in intermediary metabolism: coenzyme I, hexose diphosphate, adenosinetriphosphate, pyruvic acid, and malic acid. The susceptibility of various erythrocytes to infection by this avian malaria parasite has been studied by introducing foreign species of erythrocytes into infected chick embryos. The erythrocytes of baby rats have been found to be highly susceptible whereas those of adult rats are almost entirely resistant. Certain adult ducks which were themselves resistant to the infection had erythrocytes which were very susceptible, emphasizing the important rôle of the plasma in the resistance of the animal as a whole to this parasite. Experiments with another protozoan parasite, *Leishmania donovani*, the causative agent of an important human disease, are being directed toward the maintenance *in vitro* of the intracellular phase of the parasite.

*Plant Pathology*

Dr. Holmes is interested in the relationship between mutational changes in tobacco mosaic virus and genic changes in plant hosts. These factors cooperate to determine types of response to infection. A favorable balance between the characteristics of a pathogen and those of a potential host permits both pathogen and host to survive without obvious or severe damage to each other. Such a balance is achieved in nature very slowly, by selection through competition. Methods capable of expediting the process are needed, because frequent importations of new diseases or of new potential hosts tend to upset the natural balance. Investigations now in progress on resistance to tobacco mosaic disease in tomato and tobacco have been formulated with a view to devising generalized methods for obtaining resistance to various diseases in these and other hosts. The studies deal in part with methods for finding and utilizing the pre-existing, genetically controlled resistances of wild species related to sus-
ceptible cultivated plants. They deal also with methods of selection that would tend to disclose resistance conferred by favorable new combinations of genes in individuals of generally susceptible groups.

The work being done by Dr. L. O. Kunkel, Member Emeritus, and associates is concerned with plant diseases caused or suspected of being caused by viruses. The chief object of the work is to determine as nearly as possible the nature and potentialities of these agents. The insect-vector needle-inoculation technique and the dodder method of transmission are being used in the study of viruses of low infectivity.

Crown gall, a disease of unknown etiology but one that may be caused by a virus, is being investigated. It was found that certain crown-gall cells revert to a normal healthy condition if forced into exceedingly rapid growth. Under the conditions to which they ordinarily are subjected, the gall cells grow rather fast but not fast enough to bring recovery. When, by proper manipulation, such cells become the growing point of an adventitious bud and are supplied with large amounts of food by successive graftings to healthy plants, their growth rate is greatly accelerated. Under this regimen, they gradually lose the tumor factor acquired from the crown-gall bacterium. They become normal and remain so indefinitely unless they are again exposed to this bacterium. Recovery by rapid growth suggests that the tumor factor is eliminated by dilution and, hence, cannot be a mutated gene. The object of further studies is to characterize this factor more accurately.

An obscure virus disease of bayberry that occurs naturally in New Jersey and is not known to affect other plants is being studied. Since it is of the yellows type, the disease is suspected of being spread by a leafhopper. Efforts are being made to find the vector. Bayberry yellows can be taken to carrot and periwinkle by dodder and in the latter can be cured by heat treatments at 42°C for six days. The bayberry does not endure this treatment, so cannot be cured. The disease will be identified if it can be taken to a sufficient number of host plants. Another plant malady receiving attention is a wheat mosaic transmitted only through soil. The virus causing this disease can be taken to healthy wheat plants mechanically by means of juice but with such difficulty that it cannot be maintained very long in this way. Efforts to transmit it by dodder are being made. Efforts also are being made to determine how it persists for long periods in soils that quickly inactivate most other viruses
and to discover how it is transmitted through soil only to plants that are subjected to low temperatures.

It seems likely that the four plant viruses known to multiply in insect vectors as well as in plants depend on this multiplication for their insect specificity. One of these, the aster yellows virus, is being tested for ability to multiply in and be retained by a non-vector insect, the corn leafhopper, which however is the specific transmitter of another virus, the corn-stunt virus. Both of these viruses are transmitted to their respective vectors by needle inoculations and by feeding. Studies are being made to determine whether either virus can be transmitted by needle inoculations or can be multiplied in the non-vector insect. Studies also are being made to determine how long either insect, when allowed to feed on plants carrying virus transmitted by the other, will retain the virus it is unable to transmit. After feeding for a short time each insect retained the virus it could not transmit for about a month. How virus that does not multiply in an insect can be retained for such a long time remains unexplained. Further investigations are expected to show why a virus that is long retained but not multiplied is not transmitted, whereas one that is long retained and multiplied is transmitted.

**Physiology**

*Neurophysiology*

Dr. Lloyd and an associate are conducting studies on the physiology of the spinal cord, with particular reference to the elementary properties of those parts of neurons, the somata and axon terminals, immediately concerned in synaptic transmission, and to the integrative pattern of neuron linkages involved in the transmission of characteristic spinal reflexes.

Study on the elementary properties of neurons and their synaptic junctions has centered upon two main investigative approaches. The first of these has been to record directly from within the spinal cord the responses of motor neurons during impulse conduction, and by so doing to characterize the responses of intramedullary axons, cell bodies, and dendrites. With knowledge of the normal responses at hand, it has been possible to investigate in detail the disordered behavior of motor neurons during and following a period of asphyxiation. The methods that have been elaborated are available for the study of other means for influencing
the function of motor neurons. At the present, however, use is being made of the information concerning asphyxial behavior of motor neurons to facilitate analysis of the impact of asphyxia upon reflex transmission in the simplest reflex pathways.

The second approach to the problems of neurons and synapses has been through analysis of the potential differences that appear in dorsal and ventral nerve roots as the result of electrotonic spread thereinto of activity engendered within the spinal cord. Information gained during the study of root electrotonus has revealed many quantitative distinctions between the activity of peripheral axons and that of the juxta-synaptic regions of neurons. Since the properties of neurons in the neighborhood of their synaptic contact rather than elsewhere determine the qualities of synaptic transmission there is emerging a more adequate basis than hitherto available for the understanding of synaptic function. At the present a study is being made of the ventral root electrotonus associated with reflex action in monosynaptic reflex pathways.

In the past, analysis of spinal reflexes in terms of neuron linkages has been concerned largely with the monosynaptic connections between certain coarse afferent fibers, that arise from receptors in muscle, and motor neurons. Study of these direct connections between afferent and motor neurons has revealed the exclusive rôle such connections play in myotatic reflexes, and the manner in which the muscles of a given joint are bound together by direct reflex connection to form a functional unit. Within each such “myotatic” unit afferent fibers from a given muscle by direct reflex connection are excitatory to the motor neurons of synergists and inhibitory to motor neurons of antagonists. This knowledge of the distribution, in monosynaptic pathways, of excitation and inhibition has made it possible to study the processes independently, and so to reveal their time course, which proves to be comparable to that of the electrical change in the terminal regions of the presynaptic fibers.

More recently attention has been directed to the analysis of disynaptic reflex connections that connect certain other coarse afferent fibers, arising in muscle receptors, through interneurons to motor neurons. In general, each group of muscles that is linked by monosynaptic reflex connection is bound together also by disynaptic connection; but the direction of disynaptic effect among synergists and antagonists is precisely the inverse of the monosynaptic effect. It is now evident that the disynaptic
reflex mechanism must serve for operation of the “lengthening reaction” which, in forcible stretch of a muscle, serves to check the myotatic reflex.

Dr. Lorente de Nó and an associate are investigating the physiology of peripheral nerve and of the central nervous system. A systematic study of the physiology of nerve carried out in the past has led to the establishment of detailed correlations between nerve activity and polarization phenomena; and this information is being used as a basis for the study of several aspects of nerve physiology. Work is being done on the relationship of nerve anesthesia by agents of the cocaine type to sodium metabolism, and on the mechanism by which certain quaternary ammonium ions substitute for sodium and enable sodium-deficient nerve fibers to conduct impulses. An analysis is being made of the mechanism of action of potassium and other depolarizing ions upon nerve fibers, in an attempt to establish the conditions under which depolarization is produced, and the factors that determine the rate of depolarization. And anatomical and physiological studies are being carried out to define the physiological rôle played by the epineurium and the rest of the connective tissue sheath of nerve.

At present the work being done on the central nervous system is chiefly anatomical. Probably the greatest obstacle to the rapid progress of neurophysiology is lack of anatomical information, especially on the structure of the spinal cord, as in this territory very little has been added to the work done toward the end of the past century, chiefly by S. Ramón y Cajal. Since direct analysis of the chains of neurons and their reciprocal connections in the spinal cord is made difficult by the metameric arrangement and by the complex nature of the spinal dorsal roots, as a preliminary step, a detailed analysis of the primary nuclei of the fifth and eighth cranial nerves has been undertaken. Particularly revealing has been the study of the nuclei of the cochlear nerve, which receive fibers from only one peripheral source, the cochlea, and in which the axons of certain types of interneurons form distinct association pathways. On the basis of the information obtained in the study of bulbar structures it has become possible to begin the analysis of the structure of the dorsal horn of the spinal cord.

General Physiology

Dr. Kunitz is continuing his work on the purification and crystallization of enzymes. The work involves a study of the physical and chemical
properties of the newly isolated materials as well as of their enzymatic activities. Emphasis is placed on investigation of the kinetics of the enzymatic reactions, with the aim of learning the mechanism of action of organic catalysts.

Dr. Mirsky and his associates have under investigation the part played by the nucleus in the life of the cell. That the nucleus directs many of the activities of the cell is well known from the past fifty years' work in cytology and genetics. By means of what biochemical processes the nucleus exerts its influence is not known at present.

To learn about the chemical activities of the nucleus its composition is being studied. At first attention was directed towards the composition of the most important nuclear constituents, the chromosomes, but more recently the composition of the nucleus as a whole is also being studied. In this work isolated chromosomes and isolated nuclei are used. Chromosomes and nuclei can be isolated from quite a variety of different cells. By experimenting with different types of cells and with the same cells in different physiological states it can be seen that the composition of the chromosomes and of the nucleus as a whole is related to the nature of the surrounding cytoplasm. A study is being made of how the enzymatic activities of the nucleus are related to the metabolism of the cell. For such investigations it is necessary to use a procedure for isolating nuclei that does not at the same time remove from them their water-soluble enzymes.

A biochemical study of the cell nucleus reveals the presence of many variable components. According to genetic theory there should also be in the nucleus some chromosomal constituent responsible for genetic continuity that is present in constant amount in the different somatic cells of the same organism. It has recently been found that the various somatic cells of an organism contain a constant quantity of deoxyribonucleic acid and that the sperm cells contain one-half of this quantity. The apparent variability in deoxyribonucleic acid content, as shown by cytological observations on stained nuclei, is now seen to be due to variations in the quantity of protein associated with the nucleic acid. Interactions between constant and variable components are probably important in the chemical activities of the nucleus.

Dr. Northrop, whose laboratory is at the University of California, and an associate are engaged in a study of the mechanism of the formation of bacterial viruses. The effects of variations in the composition of the
media on the growth of the host and on the production of the virus are being systematically examined. It appears that the composition of the medium is just as important, in determining the course of the reaction, as is the strain of the organism used.

Lysogenic strains are being investigated, since these probably represent the natural host-virus system. These lysogenic cultures are quite different from susceptible strains in that infected cells multiply at the same rate as uninfected cells, while with susceptible strains, infected cells are unable to multiply. It appears that, in lysogenic cultures, the reactions involved in cell division are more distinct from those leading to virus synthesis than is the case with susceptible strains. Such cultures, therefore, offer a more favorable approach to the attempt to separate virus synthesis from growth of the host cell.

**Cytology**

Dr. Porter and an associate are engaged in studies of cell structure and function and for this are currently employing methods of electron microscopy and cell fractionation. Recent improvements in techniques for specimen preparation, particularly for thin sectioning, have greatly extended the range of application of the electron microscope so that studies in cytology need no longer be confined to cells isolated by *in vitro* culturing but may include cells as they exist *in situ* in almost any organism.

Advantage has been taken of these and earlier methods to define the fine structure of cytoplasm at levels below the range of resolution (*i.e.* below 0.2 micron) of the light microscope. In this erstwhile optically empty part of the cell there have been found a number of structural entities of wide and probably universal occurrence. These include a complicated system of strands and vesicles usually aggregated to form a reticulum. It has been named the endoplasmic reticulum. In volume and distribution it closely coincides with the distribution of the basophilic material of the cytoplasm and so occurs in large volume in glandular cells especially in those producing protein-rich secretions. Another inclusion is a class of minute granules of characteristic density which sometime associate to form filaments. This element of fine structure is common in rapidly growing cells such as occur in embryos and in tumors of the adult organism. Morphological forms transitional between these and the larger inclusions of the differentiated cell suggest that these dense granules,
called plasmablasts, exist as precursors of the mitochondria and endoplasmic reticulum and possibly other components of the cell. A continuous matrix of the cytoplasm surrounding these formed structures has been identified and within it there are frequently evident remarkable arrays of fine fibrils. As observations extend to greater varieties of materials it becomes apparent that in these and other aspects of submicroscopic morphology cells are strikingly similar if not identical.

With certain concepts of fine structure established it has become feasible to explore the rôle of these elements, especially in morphogenesis. At present studies are in progress on the origin and development of collagen fibrils and myofibrils, on spermatogenesis, and on the formation of chloroplasts. In a further exploration of function, the endoplasmic reticulum is being related to the “microsomal” fraction isolable from cells by centrifugation. Thus the biochemical data available on the latter and the morphological observations on the endoplasmic reticulum may be integrated.

The Department of the Hospital

The Hospital was established as a Department of the Institute in 1910 in order to “extend the field of its research so as to include the study of disease in the clinical aspects, under conditions as near as possible to standards of laboratory exactness and efficiency.” From its beginning to the time of his retirement in 1937, Dr. Rufus Cole was the Director. In that year he was succeeded by Dr. Thomas M. Rivers.

Although the ultimate purpose of the work carried on in the Department of the Laboratories is the prevention of disease and the relief of suffering, it has been found that in order to accomplish these ends it is frequently necessary that the studies undertaken shall concern fundamental biological processes which may not have a direct relationship to special diseases. On the other hand, the studies carried on in the Hospital, and in the laboratories directly connected with it, have in general a relationship to the diseases being investigated at any given time and are undertaken with the more immediate objectives of prevention and cure. Even in the Hospital, however, it has been deemed important that the work shall consist not merely in observation of the more superficial manifestations of disease, but that an effort shall be made to determine the causes of disease and the nature and the course of the abnormal symptoms. For carrying out these investigations, laboratories in the
Hospital have been equipped for the employment of methods developed in the sciences of physics, chemistry, physiology, microbiology, and immunology. Moreover, it is considered important that the physicians caring for the patients shall themselves engage in these studies, since not infrequently careful observation of patients yields suggestions for lines of research which might otherwise be overlooked. The present scope of the investigations being carried on in the Hospital is outlined below.

**Acute Respiratory and Viral Diseases**

Various forms of acute infection of the respiratory tract are being investigated; these include the syndromes which are designated the common cold, influenza, primary atypical pneumonia, and bacterial pneumonia. Efforts are being directed toward learning more about the environmental and physiological factors which influence respiratory infections and about the nature of the infectious agents associated with these diseases.

Certain groups of viruses as well as a wide variety of bacterial species appear to be intimately associated with the pathogenesis of respiratory infections. However, the causal factors responsible for many respiratory diseases have not yet been established. If measures adequate for the control of these diseases are to be developed, it seems evident that information on the nature of the primary incitants is of great importance and that knowledge of the pathogenesis of the several infections is essential.

Laboratory models suitable for the close study of respiratory diseases in experimental animals have been developed. In certain instances these infections are analogous to those of human beings and suggest avenues of investigation not previously traversed.

Diseases in addition to those which chiefly cause respiratory symptoms are also under study; these include mumps, measles, chicken-pox, herpes simplex, and infectious mononucleosis. Major emphasis is directed towards gaining additional information about the infectious agents associated with these illnesses.

The mechanism of the multiplication of viruses is under detailed investigation, as also is the mechanism of the induction of pathological states during viral infections. More information regarding the dynamics of host tissue–infectious agent systems should further efforts to control
infectious processes. Substances capable of exerting chemotherapeutic effects on experimental infections induced with small viruses have been discovered. The mechanism of the intracellular action of such substances and the basis for their specificity are under exploration.

**Rheumatic Fever**

It is now recognized that this disease occurs as a sequela of hemolytic streptococcal infection. However, little is known of the mechanism by which the streptococcal infection gives rise to a disease with the varied clinical manifestations and protracted course of rheumatic fever. In order to obtain an understanding of this mechanism, additional information of a fundamental nature is being sought in two broad fields of study: (1) the biology of the streptococcus and (2) the host reaction to infection. Studies on the antigenic structure of group A hemolytic streptococci are being continued, including attempts to isolate and characterize certain of the major antigenic components of the cell. In addition, some of the numerous biologically active, extracellular products of these cells are under investigation, since it is probable that these substances are released in host tissues which may be injured by them. Patients with streptococcal infections and rheumatic fever are admitted to the Hospital for treatment and for study of the host reaction to infection; serological and biochemical techniques are being used in these investigations. Finally, because of the great opportunity for further study of the disease that would result if the syndrome of rheumatic fever were reproducible in laboratory animals, attempts to achieve this are still in progress.

**Cardiovascular Diseases**

Clinical studies in progress are directed to the discovery of improved methods for the treatment of hypertension and arteriosclerosis. The rôle of diet is being analyzed through observation of the physiological responses of patients under treatment. It is known that various restrictive diets are beneficial in some instances, but the means by which the diets exert their therapeutic effect are incompletely understood. Therefore, the best diets that can be designed, according to current knowledge, are given to patients under conditions that allow exact measurement of their metabolic balance and detailed observation of their medical status. In addition to the standard clinical tests, special tests such as measurement
of the activity of the sweat glands are employed to reveal the function of hormonal factors in the body during the response to treatment.

In conjunction with the clinical studies, laboratory investigations are directed to the problems of calcification of the tissues, lipid chemistry, and the metabolism of pressor amines. Each of these investigations bears upon an aspect of the central clinical problems and supplements the information that can be obtained in the clinical studies.

Endocrine Disorders, Excluding Diabetes Mellitus

Hormones exert a profound influence on metabolic processes in the human body, and, in some manner as yet not understood, these substances regulate enzyme activity either directly or indirectly. Laboratory investigations associated with clinical studies may give clues as to the mechanisms by which the hormones exert their influence on enzymatic systems involved in the metabolic processes already shown to be affected by hormones. Before laboratory investigations of these problems can be conducted to best advantage it is necessary, first, to develop improved methods for the fractionation and the quantitative detection of various hormones or their metabolic products. Such methods are being developed, and children having abnormalities of growth or maturation are being studied clinically. Attempts are made to ascertain which biochemical processes involved in their growth and development deviate from normal to an appreciable extent, and which of these processes are limiting factors in growth or maturation. Investigations are being conducted also on the effect on those reactions of administration of (a) supplementary hormone to persons with hypofunction and (b) certain drugs which decrease hormone production to persons with hyperfunction.

Acute and Chronic Diseases of the Liver

It has become apparent that a number of different types of liver disease are prevalent in this country in addition to the well known infectious hepatitis and alcoholic cirrhosis. The causative agents involved in the newly recognized forms of liver disease are unknown, but in view of specific biochemical abnormalities the types can be classified and studied. At the present time, investigations have been directed chiefly to defects in protein metabolism that may throw light on these conditions. Special methods for the analysis of proteins have been employed, and these have
led to a study of other disorders of protein metabolism not involving the liver.

Although diseases of the liver of known and unknown etiology are caused by widely diversified mechanisms, many of the manifestations are similar; inadequate synthesis of metabolites essential to the body by the damaged liver brings on a picture of an intrinsic deficiency disease. The recognition and replacement of these deficiencies depend on advances in the field of biochemistry and offer a progressive line of therapeutic investigation.

BUILDINGS AND EQUIPMENT

The location of the Institute is in New York City, on the cliff overlooking the East River and lying between 63rd and 68th Streets (see frontispiece). This site ensures excellent light and air, and greater quiet than could be secured in the more accessible parts of the city. There are three laboratory buildings, a hospital building, nurses' residence, a library building, animal house, greenhouses, and a central power house. All these buildings are connected by service tunnels.

Of the laboratory buildings, the Central Laboratory was first erected. It was occupied in 1906, and contains laboratories and administration offices. It covers an area of 136 feet by 60 feet and has five main floors, a light basement, and isolation units and kennels on the roof. The second, or Middle Laboratory, opened in 1916, contains six floors and two basements and covers an area of 150 feet by 62 feet. The third laboratory building, known as the North Laboratory, was opened in 1931. It occupies a ground area of 197 feet by 60 feet, and has seven floors and two basements.

All the above buildings are fireproof and so constructed that all interior partitions can be altered or removed as occasion requires. Provision is made for supplying hot and cold water, steam, gas, compressed air, suction, and both direct and alternating current electricity to all laboratories. Numerous cold rooms refrigerated by means of a brine circulation system, and also incubator rooms, are located in central positions in the buildings and form part of their permanent equipment. Special requirements for constant temperature work, sometimes with humidity control as well, are met as occasion requires. If the temperature called for is below that normally furnished by the central brine system supplementary freon refrigerating units are used. Pipes, drains,
vents, and conduits are either exposed or carried in accessible ducts wherever possible, to facilitate inspection or alteration. In these buildings, largely devoted to laboratories, are also an assembly room and quarters for various auxiliary services.

The Hospital. The Hospital consists of a main structure, opened in 1910, 165 feet long by 54 feet wide, and a wing to the south, opened in 1951, 118 feet long by 49 feet wide. The main building has eight main floors with a ground floor and basement in the wall of the East River cliff extending also under the four story wing. At the third floor level an enclosed bridge crosses to the nurses' residence to include access in that building to a small surgical suite for minor and emergency operations, and then on through by a bridge to the Central Laboratory building in which the laboratories of the Department of the Hospital and the X-Ray Service are housed.

The hospital, when alterations in the main building now under way are completed, will have provision for a total of 56 beds on the third and fourth floors. On each of the two floors there will be four 4-bed wards, each with its own utility and service rooms, permitting their operation if occasion demands as separate infectious areas. In addition to the 4-bed wards there are 22 individual rooms and one room for 2 beds in the wing. The standard individual room is 11 feet 4 inches by 11 feet 8 inches and each has a separate toilet and a special arrangement of equipment to facilitate the nursing care of patients. All these rooms, including the 4-bed wards, have separate air intakes and exhaust ventilation. Those rooms especially set aside for infectious diseases are so arranged that the air intake automatically cuts out when the door to the corridor is opened, thus leaving the room under negative pressure. At the entrance to each of these infectious rooms there is installed over the door an ultraviolet lamp which is so housed that its rays are directed downward only and not laterally. On the fourth floor of the wing there is a kitchen for the preparation of special diets and on the third floor an oxygen-supplied, air-conditioned chamber of sufficient size to receive 2 beds. The administrative offices, reception rooms, medical history rooms, pharmacy, seminar, and general dining rooms for staff and nurses are on the first floor of the main building and wing. A dispensary for out-patients and the general kitchen with its cold storage facilities are on the ground floor. In the basement, with windows opening on the East River, is the laundry, servicing the laboratories as well as the hospital. The fifth, sixth, and
second floors are set aside for the housing of the resident staff and employees. The seventh and eighth floors, except for an electrocardiograph installation on the eighth floor, are reserved for future development.

The Library Building, located to the east of the Central Laboratory, was occupied in 1929. The building is 89 feet by 70 feet, with two high stories above ground and three levels of basement floors below. The library is located on the top floor, and with a mezzanine has a capacity of 38,500 volumes. There is also on the lower levels additional storage space to provide for present needs and future expansion. On the ground level is located a room with a floor space of 72 feet by 35 feet, which serves as a staff dining room and assembly hall. There are also on this floor a small formal dining room, and a dining room for women employees. In the basement levels are located a kitchen, stack space for the storage of publications of the Institute, and other rooms reserved for general purposes.

The Animal House, with connecting corridors to the Middle and the North Laboratories, is located to the east of the laboratories and occupies floors down to the East River drive level. The older part of the animal house, built in 1916 to the east of the Middle Laboratory, is six stories in height and occupies an area of 77 feet by 62 feet. In this section there are provided special quarters for isotope-bearing animals in cages under negative pressure, isolation rooms, space for the larger animals with outside paddocks for horses and sheep, rooms for the storage and preparation of food, and a central service for the cleaning and sterilizing of cages. The newer section, opened in 1931, is in two parts, each four stories in height, one opposite 67th Street, having an area of 96 feet by 83 feet, containing receiving rooms, mouse breeding colonies, and special small rooms each with an outside runway on the top floor, and the second part, 94 feet by 60 feet, having direct connection on all floors with the North Laboratory. The latter part, aside from housing an incinerator for refuse, is fully used for animal observation.

The construction of the animal house is such that all walls, either of hard surfaced brick or tile, can be washed down readily. The cages are in general suspended from the ceiling on metal racks rather than being placed on the floor.

Greenhouses. In order to provide facilities for Plant Pathology in New York, greenhouses were built in 1948. Two greenhouses, one 30 feet
in length and the other 40 feet in length, both 25 feet in width, together with two insect vector units, are located on the roof of the animal house, and open directly from the Plant Pathology laboratories on the third floor of the Middle Laboratory. The main group of greenhouses is located at 64th Street where there is open exposure to the south. Here there are six greenhouses, 65 feet in length, of which three are 25 feet wide and three 18 feet wide. Serving these houses is a potting shed in which is located a large sterilizer for use with infected plants, as well as the general facilities.

A Power House built in 1915 and operated by the Institute provides the buildings with heat, direct current electricity, used mainly for power and general lighting, refrigeration, compressed air, and suction. Alternating current used for fluorescent lighting and special equipment is purchased from the Edison system.

Children's Gardens and Playgrounds. The founder of the Institute has made generous provision for its future physical growth by gifts of land lying between York Avenue and the East River water-front and extending from 63rd Street to 68th Street. Pending the development of the work of the Institute, the Trustees have arranged for temporarily assigning the unused portions of this property adjoining York Avenue between 64th and 68th Streets to the New York Plant and Flower Guild for maintenance of Children's Gardens. The use of the block between 63rd and 64th Streets as a park-playground has been temporarily extended to the Department of Parks.

PUBLICATIONS

In order to assist in the dissemination of the reports of scientific investigations conducted at the Rockefeller Institute, and elsewhere, the following publications are maintained by the Institute.

The Journal of Experimental Medicine. This journal, edited by Peyton Rous, Herbert S. Gasser, and René Dubos, is designed to cover the field of experimental medicine. It is a medium for the publication of investigations conducted at the Institute, and it also accepts contributions of a suitable character from other sources. It is issued monthly, two volumes appearing in a year. INDEXES for Volumes 1 to 20, 21 to 40, and 41 to 60 have been published.

Contributions should be sent to the editors of The Journal of Experimental Medicine. They should be limited preferably to
twenty printed pages, not counting the space occupied by illustrations. Articles which exceed in length twenty-five printed pages will be returned to the authors in order that their contents may be reduced to this maximum. Authors can obtain reprints of their papers at cost.

The Journal of General Physiology. This journal, the first number of which appeared in 1918, was founded by Jacques Loeb. It is devoted primarily to investigations of fundamental laws of life processes, particularly in their chemical and physical aspects. The journal is edited by L. R. Blinks (Stanford University), W. J. Crozier (Harvard University), Wallace O. Fenn (The University of Rochester), A. E. Mirsky (Rockefeller Institute), John H. Northrop (Rockefeller Institute), and W. J. V. Osterhout (Rockefeller Institute). It is issued bimonthly, one volume appearing in a year.

Contributions should be sent to the editors of The Journal of General Physiology, York Avenue and 66th Street, New York 21, N. Y. The papers should be limited preferably to twenty printed pages, not counting the space occupied by illustrations. Authors can obtain reprints of their papers at cost.

Studies from The Rockefeller Institute for Medical Research. Results of investigations made at the Rockefeller Institute are first reported in a variety of publications. The reports are ultimately assembled in volumes designated Studies from The Rockefeller Institute for Medical Research, which appear serially, but at irregular intervals. The first volume was published in 1904, and in May, 1952, the one hundred and forty-fourth volume appeared. Each volume contains about 600 pages, and is indexed. The number of volumes of Studies appearing annually averages two. An Author and Subject Index for Volumes 1 to 25, and one for Volumes 26 to 50, have been published. An Author Index for Volumes 51 to 116 has also been published.

Studies from The Rockefeller Institute for Medical Research are distributed gratis to a selected list of libraries and laboratories throughout the world, and the volumes as they appear may also be secured through subscription.

Monographs. The Monographs consist of scientific papers which are so extensive, or which require such elaborate illustration, that they are unsuitable for current periodical issues of journals. They are published at irregular intervals, determined by the available material on hand. In a small number of instances the results of investigations
carried out by other laboratories have been included in this series. Twenty-three Monographs have appeared during the years 1910 to 1952. The Monographs that have been published are advertised on the covers of The Journal of Experimental Medicine, The Journal of General Physiology, and the Studies.

Semiannual List. This list enumerates the title and place of publication of the reports in the Studies as well as of preliminary reports and reviews which are not republished in the Studies. Copies of this list will, upon request, be sent regularly to persons interested. Semiannual List No. 72 was published in June, 1952.

Subscriptions, and all inquiries relating to the publications of the Institute, should be addressed to the Publication Service, The Rockefeller Institute for Medical Research, York Avenue and 66th Street, New York 21, N. Y.

The Publication Service does not have reprints of the papers in the Semiannual List, but in some instances reprints can be obtained by addressing a request directly to the author.

Subscriptions

Subscriptions to the above publications may be obtained at the following rates, payable in advance:

The Journal of Experimental Medicine, $15.00 a year; $1.50 for single copies.

The Journal of General Physiology, $7.50 a year; $1.50 for single copies.

Studies from The Rockefeller Institute for Medical Research, $2.00 per volume.

Monographs, usually $2.00 each. The price is determined at the time of publication.
ACKNOWLEDGMENTS

Bequests and gifts for the promotion of medical research which have been received from others than Mr. John D. Rockefeller and Mr. John D. Rockefeller, Jr., are as follows:

For General Purposes
  Legacy from John M. Van Heusen
  Legacy from Anthony Gross
  Legacy from Mary P. O. Harrison
  Legacy from Edith A. Cohen
  Legacy from Edward P. Loy
  Gift from James P. Stokes
  Gift in memory of Dr. Lewis Jack
  Gift from John L. Pelissier

For the Promotion of Cancer Research
  Legacy from Henry Rutherford
  Legacy from Viola Gray Egley
  Legacy from Michael J. Curley
  Gift from Public School No. 158 of Brooklyn, N. Y., in memory of Belle O. Cooper
  Gift in memory of Esther Ruth Harris Robbins
  Gift from Jean P. Lane
  Gift from Felicia Caponegro

For the Study of Leukemia
  An anonymous gift

For the Study of Metabolic Diseases
  Gift in memory of Dr. Leslie T. Webster